

# Work Order ID 85312

Wednesday, June 06, 2012 10:50:43 AM

Page 1

Item ID: D412-742-013

Revision ID:

Item Name: Float Skidtube Installation

Start Date: 6/5/2012 Start Qty: 1.00

Required Date: 6/6/2012 Req'd Qty: 1.00

Reference: RMA RA111368

Approvals: Process Plan: *MF*

QC:

Date: 12-06-06 Tooling:

Date: SPC (Y/N):

\*N9000040100\*

Setup Start \*NS1\*

Stop \*NS2\*

Cust Item ID:

Customer: CU-DAR001

Run Start \*NR1\*

Stop \*NR2\*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr	Revision Nbr
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IIN D412-742	E
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100

0.00

\*100\*

QC

Quality Control

Memo

0.00

INSPECT RA 111368 D412-742-013 B 83616

BUFF OUT MARKS FROM SHIPPING DAMAGE

ENG APPROVAL NEEDED BEFORE CONTUNING

TOUCH UPS NEEDED ON FWD CAP

110

0.00

\*110\*

Skidtubes

Skidtubes

Memo

0.00

BUFF MARKS ON D3391-023 AND WAIT ON ENGINEERING APPROVAL  
ON WHETHER PART IS SAVABLE

<b>DART</b> Dart Aerospace Ltd. 1270 ABERDEEN ST. HAWKESBURY, ONT CANADA K6A 1K7				TO APPROVAL 4-09-89 TEL 1-813-682-5200	
P/N	D412-742-013	Q/C	CHG007		
DESC.	Float Skidtube	STC	SR01583SE		
LOT	B83615	STC	SH05-37		
MODEL	205/210/212/412/AB412	STC			
PATENTS US 7,573,519 CA 2,222,218 EUROPEAN 1,208,265				MADE IN CANADA	

Acceptable 6/12/6/21

1 x 4 JLL n10012c

# Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	
12/06/21	110	Assemble with: AN3C-4A / M121205 (bolts) (1) D2646 / B88443 end-cap NAS1149C0332R / M122063 (washers) D3591-1 / B83237 D3672-1 / B80369 (Phenolic washers) (X1)	JH	12/06/26	X4 X4 X1 X1			
12/06/21	110	Strip & Reallocate Fwd extrusion / QC3 PART FINISH 2) POWDER COAT: START: 10:40 120222 Temp: 320° FW: 11:10.	JH	12/06/26	X1			
		1 X	BL	12/06/25		12/06/25	12/06/25	

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

**Work Order ID 85312**

Wednesday, June 06, 2012 10:50:43 AM

**\*85312\***

Page 2

Item ID: D412-742-013

Accept

**\*N900040100\***Setup Start **\*NS1\***

Revision ID:

Stop **\*NS2\***

Item Name: Float Skidtube Installation

Start Date: 6/5/2012 Start Qty: 1.00

**\*1\***

Cust Item ID:

Required Date: 6/6/2012 Req'd Qty: 1.00

**\*1\***

Customer: CU-DAR001

Reference: RMA RA111368

Approvals: Process Plan:

Date:

Tooling:

Date:

Run Start **\*NR1\***

QC:

Date:

SPC (Y/N):

Date:

Stop **\*NR2\***Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

120

0.00

**\*120\***

QC

Memo

0.00

Quality Control

ENGINEERING APPROVAL

*See Attached E-mail  
6/12/06/08*

130

0.00

**\*130\***

HandFinish

Memo

0.00

Hand Finishing

TOUCH UP AND RE-ASSEMBLE PER DRAWING

INSTALL NEW HARWARE AND DISCARD OLD HARDWARE

\*ENG TO DETERMINE WHETHER TO REPLACE MID TUBE\*

*Acceptable GP 12/6/21**1x of M 12/06/21*

140

QC5- Inspect part completeness to step on W/O

0.00

**\*140\***

QC

Memo

0.00

Quality Control

*12/06/21*

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_  
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# Work Order ID 85312

Wednesday, June 06, 2012 10:50:43 AM

**\*85312\***

Page 3

Item ID: D412-742-013

Accept

**\*N900040100\***

Setup Start **\*NS1\***

Revision ID:

Stop **\*NS2\***

Item Name: Float Skidtube Installation

Start Date: 6/5/2012 Start Qty: 1.00 **\*1\***

Cust Item ID:

Required Date: 6/6/2012 Req'd Qty: 1.00 **\*1\***

Customer: CU-DAR001

Reference: RMA RA111368

Approvals: Process Plan: Date:

Tooling: Date:

Run Start **\*NR1\***

QC: Date:

SPC (Y/N): Date:

Stop **\*NR2\***

Sequence ID/  
Work Center ID

Operation  
Description

Set Up/  
Run Hours

Tool ID

Tool #

Plan  
Code

Accept  
Qty

Reject  
Qty

Reject  
Number

Insp.  
Stamp

150

Identify as per dwg & Stock Location: \_\_\_\_\_

0.00

**\*150\***

Packaging

Memo

0.00

Packaging

ID AND STOCK UNDER NEW BATCH NUMBER

160

QC21- Final Inspection - Work Order Release

0.00

**\*160\***

QC

Memo

0.00

Quality Control

*Skidtube is now a  
L412-742-013  
Kit was  
already used  
in another  
order*

*OK 12/7/11*

*MF  
12-07-09*

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

**Part No:** \_\_\_\_\_ **PAR #:** \_\_\_\_\_ **Fault Category:** \_\_\_\_\_ **NCR:** Yes No **DQA:** \_\_\_\_\_ **Date:** \_\_\_\_\_  
**Resolution:** \_\_\_\_\_ **Disposition:** \_\_\_\_\_ **QA: N/C Closed:** \_\_\_\_\_ **Date:** \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# Picklist Print

Wednesday, June 06, 2012 10:50:43 AM

Page 1

Work Order ID: 85312  
 Parent Item: D412-742-013  
 Parent Item Name: Float Skidtube Installation

Start Date: 6/5/2012  
 Start Qty: 1.00

Required Date: 6/6/2012  
 Required Qty: 1.00

Comments: IPP Rev: A05.10.13New Issue KJ/JLM  
 IPP Rev:B 06-06-08 As per DSI9336 JLM DD verified by:JLM  
 IPP Rev:D 08-09-08 ecn 08-510 DD verified by:EC  
 IPP Rev:E 09-01-23 as per DSI9441 DD verified by:EC IPP RevF: add AN4C7A DD  
 10.01.13 verified by:EC IPP Rev:G 11.11.01 as per DSI9517 REV.B DD verified  
 by:EC IPP rev:H 12.01.12 PER IIN REV.E DD VERF: IPP Rev:I add AN4C47A  
 DD 12.03.14 verified by:EC

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
AN3C4A BOLT		Purchased	No				Each	1,262.0000		24	N/A		

Location	Loc Qty	Loc Code
ST350	1262	
120187	57	
120521	28	
120769	38	
121205	900	
121556	239	

AN3C6A BOLT	Purchased	No				Each	451.0000		10	N/A		
----------------	-----------	----	--	--	--	------	----------	--	----	-----	--	--

Location	Loc Qty	Loc Code
FP001	1	
111982	1	
ST351	450	
111982	2	
116419	23	
116549	2	
116704	12	
117619	10	
117688	1	
117872	5	
118422	13	
119449	21	
120423	3	
120693	158	
121682	200	

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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# Picklist Print

Wednesday, June 06, 2012 10:50:43 AM

Page 2

Work Order ID: 85312

Parent Item: D412-742-013

Parent Item Name: Float Skidtube Installation

Start Date: 6/5/2012

Required Date: 6/6/2012

Start Qty: 1.00

Required Qty: 1.00

AN3C7A Purchased No Each 140.0000

BOLT

10/10

## Location

## Loc Qty

## Loc Code

ST351

140

113149

14

116169

1

117313

10

117619

12

117688

6

119749

1

120731

8

121185

50

121541

38

AN960C10L

NAS1149C0332R

Purchased

No

Each

0.0000

38 10/10

X PTO

washer

D412-742-013

Manufactured

No

Each

0.0000

Float Skidtube Installation

1383615<sup>1</sup> (x1) 11/12/06/25

Wednesday, June 06, 2012 10:50:43 AM

Shop Packet Print

Page 2

# Dart Aerospace Ltd

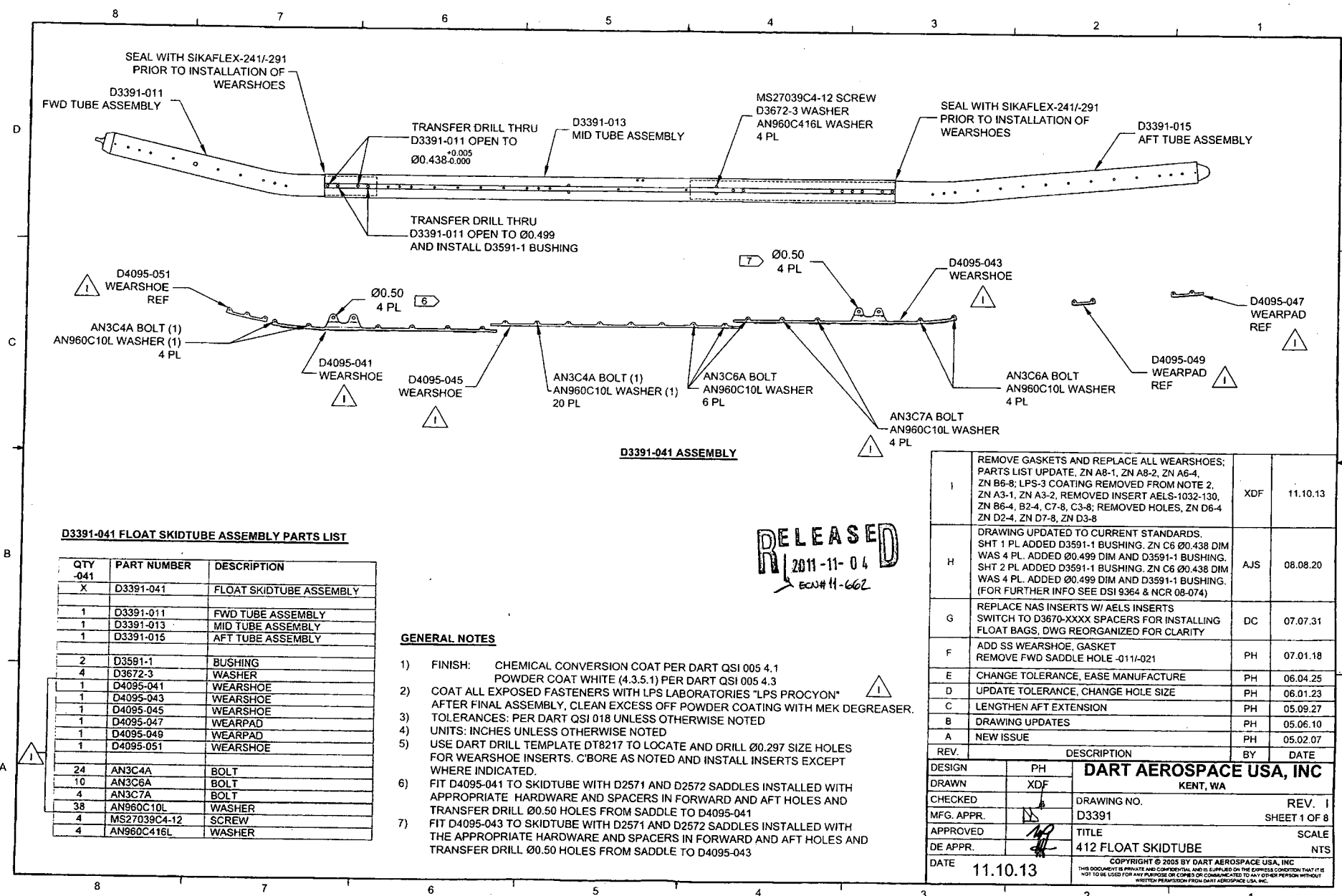
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector
12/06/25	110	Assemble with: NAS1330C3K13-116/M10337 inserts AHS4:1032-225/M121269 (inserts)	ju	12/06/25	X4 X10		

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries



**D3391-041 FLOAT SKIDTUBE ASSEMBLY PARTS LIST**

QTY -041	PART NUMBER	DESCRIPTION
X	D3391-041	FLOAT SKIDTUBE ASSEMBLY
1	D3391-011	FWD TUBE ASSEMBLY
1	D3391-013	MID TUBE ASSEMBLY
1	D3391-015	AFT TUBE ASSEMBLY
2	D3591-1	BUSHING
4	D3672-3	WASHER
1	D4095-041	WEARSHOE
1	D4095-043	WEARSHOE
1	D4095-045	WEARSHOE
1	D4095-047	WEARSHOE
1	D4095-049	WEARSHOE
1	D4095-051	WEARSHOE
24	AN3C4A	BOLT
10	AN3C6A	BOLT
4	AN3C7A	BOLT
38	AN960C10L	WASHER
4	MS27039C4-12	SCREW
4	AN960C416L	WASHER

**GENERAL NOTES**

- 1) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
POWDER COAT WHITE (4.3.5.1) PER DART QSI 005 4.3
- 2) COAT ALL EXPOSED FASTENERS WITH LPS LABORATORIES "LPS PROCYON"  
AFTER FINAL ASSEMBLY, CLEAN EXCESS OFF POWDER COATING WITH MEK DEGREASER.
- 3) TOLERANCES: PER DART QSI 018 UNLESS OTHERWISE NOTED
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED
- 5) USE DART DRILL TEMPLATE DT8217 TO LOCATE AND DRILL Ø0.297 SIZE HOLES  
FOR WEARSHOE INSERTS. C'BORE AS NOTED AND INSTALL INSERTS EXCEPT  
WHERE INDICATED.
- 6) FIT D4095-041 TO SKIDTUBE WITH D2571 AND D2572 SADDLES INSTALLED WITH  
APPROPRIATE HARDWARE AND SPACERS IN FORWARD AND AFT HOLES AND  
TRANSFER DRILL Ø0.50 HOLES FROM SADDLE TO D4095-041
- 7) FIT D4095-043 TO SKIDTUBE WITH D2571 AND D2572 SADDLES INSTALLED WITH  
THE APPROPRIATE HARDWARE AND SPACERS IN FORWARD AND AFT HOLES AND  
TRANSFER DRILL Ø0.50 HOLES FROM SADDLE TO D4095-043

**RELEASED**  
2011-11-04  
EOW#11-662

I	REMOVE GASKETS AND REPLACE ALL WEARSHOES; PARTS LIST UPDATE, ZN A8-1, ZN A8-2, ZN A6-4, ZN B6-8; LPS-3 COATING REMOVED FROM NOTE 2, ZN A3-1, ZN A3-2, REMOVED INSERT AELS-1032-130, ZN B6-4, B2-4, C7-8, C3-8; REMOVED HOLES, ZN D6-4 ZN D2-4, ZN D7-8, ZN D3-8	XDF	11.10.13
H	DRAWING UPDATED TO CURRENT STANDARDS. SHT 1 PL ADDED D3591-1 BUSHING, ZN C6 Ø0.438 DIM WAS 4 PL. ADDED Ø0.499 DIM AND D3591-1 BUSHING. SHT 2 PL ADDED D3591-1 BUSHING, ZN C6 Ø0.438 DIM WAS 4 PL. ADDED Ø0.499 DIM AND D3591-1 BUSHING. (FOR FURTHER INFO SEE DSI 9364 & NCR 08-074)	AJS	08.08.20
G	REPLACE NAS INSERTS W/ AELS INSERTS SWITCH TO D3670-XXXX SPACERS FOR INSTALLING FLOAT BAGS, DWG REORGANIZED FOR CLARITY	DC	07.07.31
F	ADD SS WEARSHOE, GASKET REMOVE FWD SADDLE HOLE -011/-021	PH	07.01.18
E	CHANGE TOLERANCE, EASE MANUFACTURE	PH	06.04.25
D	UPDATE TOLERANCE, CHANGE HOLE SIZE	PH	06.01.23
C	LENGTHEN AFT EXTENSION	PH	05.09.27
B	DRAWING UPDATES	PH	05.06.10
A	NEW ISSUE	PH	05.02.07
REV.	DESCRIPTION	BY	DATE
DESIGN	PH	<b>DART AEROSPACE USA, INC</b> KENT, WA	
DRAWN	XDF		
CHECKED		DRAWING NO.	REV. I
MFG. APPR.		D3391	SHEET 1 OF 8
APPROVED		TITLE	SCALE
DE APPR.		412 FLOAT SKIDTUBE	NTS
DATE	11.10.13	COPYRIGHT © 2005 BY DART AEROSPACE USA, INC THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSES OR COMES OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE USA, INC.	

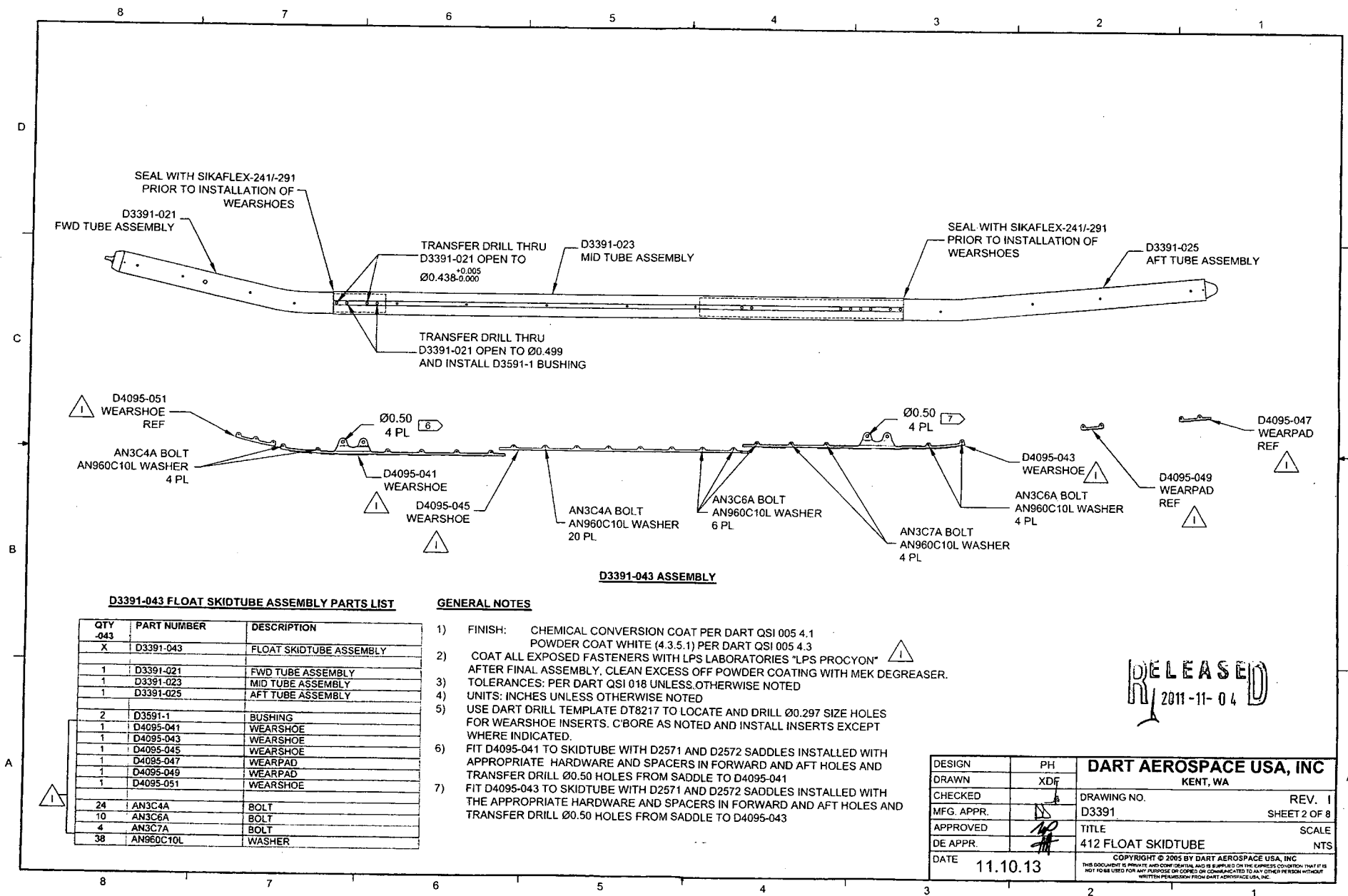
# Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_  
 Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



**Dart Aerospace Ltd**

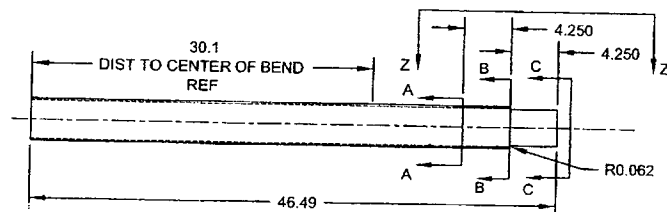
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

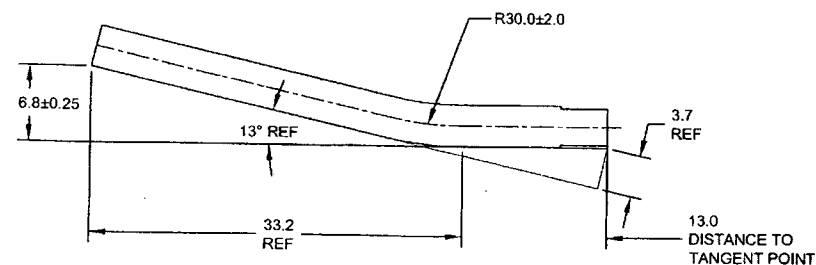
Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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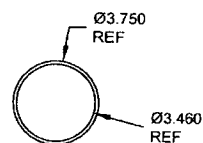
**NOTE:** Date & initial all entries



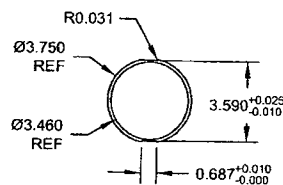
**D3391-1 CUTTING DETAIL**  
(MAKE FROM D6013-047 SKIDTUBE MATERIAL)



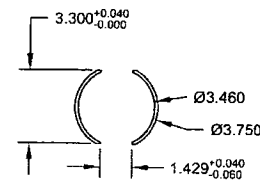
**D3391-011/-021 BENDING DETAIL**  
(MAKE FROM D3391-1)



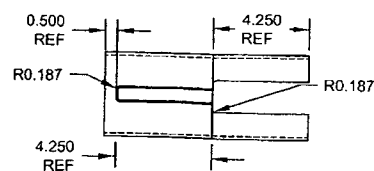
**SECTION A-A**  
SCALE 2X



**SECTION B-B**  
SCALE 2X



**SECTION C-C**  
SCALE 2X



**VIEW Z-Z**  
SCALE 2X

RELEASED  
2011-11-04

DESIGN	PH	<b>DART AEROSPACE USA, INC</b>	
DRAWN	XDF	KENT, WA	
CHECKED		DRAWING NO. D3391	REV. I
MFG. APPR.			SHEET 3 OF 8
APPROVED		TITLE	SCALE
DE APPR.		412 FLOAT SKIDTUBE	NTS
DATE	11.10.13	<small>COPYRIGHT © 2005 BY DART AEROSPACE USA, INC THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE USA, INC.</small>	

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Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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# RA 111368

Received @ Dart June 5<sup>th</sup>, 2012  
Inspected@ Dart June 5<sup>th</sup>, 2012

Customer: Bristow US LLC  
Customer Contact: Lynn Castille  
Shipped from: New Iberia LA USA

## **Instructions for RA111368 D412-742-013 B83616 CHG007**

- Touch ups needed on D3391-025
- Buff out marks from shipping damage and measure
  - Have eng signoff for dims
- Touch ups needed on fwd cap
- All work need must be done on new work order
- Needs new labels and paper work
- Needs new batch #

Time Estimate = 3 HOURS

Departments Required: Finishing (2h reworking) & Stores (1h-restocking)

Pictures Attached = YES

**THIS INSTRUCTION SHEET MUST  
BE ATTACHED TO THE  
RESTOCKING WORK ORDER AT  
ALL TIMES!!!!**

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_  
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

**Linda Lacelle**

---

**From:** David Shepherd <dshepherd@dartaero.com>  
**Sent:** June-07-12 5:23 PM  
**To:** 'Chris Provencal'  
**Cc:** 'Mike Petsche'; 'Linda Lacelle'  
**Subject:** RE: NCR D3391 mid tube

Chris,

Agree that is acceptable to repair this damage and salvage the tube.

David

---

**From:** Chris Provencal [<mailto:cprovencal@dartaero.com>]  
**Sent:** June-06-12 12:50 PM  
**To:** David Shepherd  
**Cc:** Mike Petsche  
**Subject:** NCR D3391 mid tube

David,

Two tri-beams were damaged during shipment to the customer. I've been asked to do what I can to see if they can be salvaged. Attached are two pictures of one of the tubes (the second tube will follow in another email).

The tube was gouged, on the top of the ridge, and just above the ridge. It's located 38.8" from the fwd edge of the mid-tube, ie. approximately in the middle of the tube. They've buffed out the affected region, leaving an approx. 0.5" x 0.5" area with a wall thickness of 0.087". The D2500 gives the wall thickness at 0.100+/-0.010. The surrounding area is 0.099" wall.

If this was a production tube and the damage was from excessive grinding, I would be inclined to accept the tube because the wall thickness is close to being in tolerance, located near the neutral axis, and located on the top of the tube where it's not likely to be hitting rocks and such. But because the damage is from a hard impact with an object, I am inclined to get your approval.

We can also build the area back up with welding. It's in a region where the ICA allows weld repairs.

-Chris

## Chris Provencal

---

**From:** David Shepherd <dshepherd@dartaero.com>  
**Sent:** Thursday, June 07, 2012 5:23 PM  
**To:** 'Chris Provencal'  
**Cc:** 'Mike Petsche'; 'Linda Lacelle'  
**Subject:** RE: NCR D3391 mid tube

Chris,

Agree that is acceptable to repair this damage and salvage the tube.

David

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**From:** Chris Provencal [<mailto:cprovencal@dartaero.com>]  
**Sent:** June-06-12 12:50 PM  
**To:** David Shepherd  
**Cc:** Mike Petsche  
**Subject:** NCR D3391 mid tube

David,

Two tri-beams were damaged during shipment to the customer. I've been asked to do what I can to see if they can be salvaged. Attached are two pictures of one of the tubes (the second tube will follow in another email).

The tube was gouged, on the top of the ridge, and just above the ridge. It's located 38.8" from the fwd edge of the mid-tube, ie. approximately in the middle of the tube. They've buffed out the affected region, leaving an approx. 0.5" x 0.5" area with a wall thickness of 0.087". The D2500 gives the wall thickness at 0.100+/-0.010. The surrounding area is 0.099" wall.

If this was a production tube and the damage was from excessive grinding, I would be inclined to accept the tube because the wall thickness is close to being in tolerance, located near the neutral axis, and located on the top of the tube where it's not likely to be hitting rocks and such. But because the damage is from a hard impact with an object, I am inclined to get your approval.

We can also build the area back up with welding. It's in a region where the ICA allows weld repairs.

-Chris

## Chris Provencal

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**From:** David Shepherd <dshepherd@dartaero.com>  
**Sent:** Thursday, June 07, 2012 5:27 PM  
**To:** 'Chris Provencal'  
**Cc:** 'Mike Petsche'; 'Linda Lacelle'  
**Subject:** RE: NCR D3391 FWD TUBE

Chris,

Agree that it is acceptable to repair this damage and salvage this tube as well. If there was a way to do a hardness check on the heat affected area, then I would recommend doing that just to see what we're dealing with.

David

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**From:** Chris Provencal [<mailto:cprovencal@dartaero.com>]  
**Sent:** June-06-12 1:43 PM  
**To:** David Shepherd  
**Cc:** Mike Petsche  
**Subject:** NCR D3391 FWD TUBE

David,

The second of the tubes was obviously dragged on the ground/road/something. One of the fwd cap bolts was ground flush with the skid tube, which was partially ground itself. When they cut the bolt out, the inner part of the bolt was black, with some blackening of the paint on the skid and fwd cap. So there was a great deal of heat being generated.

The only other damage on this tube is a small dent in the aft cap (other end of the tube), which can be replaced.

They've cleaned up the damaged area, grinding it smooth/round (clean1.jpg/clean2.jpg). The hole is not elongated. The thickness at the hole is 0.142" (dwg = 0.145) and transitions to 0.115" thick at the fwd edge of the tube.

The only real issue is the towing load from the fwd cap. So I wouldn't consider this tube to have a potential safety issue. If the first hole is considered to be heat affected, the strength in the remaining 3 holes is: yield bearing = 97ksi x 0.188 x 0.145 x 3 = 2644 x 3 = 7,932 lb for the single tube.

I would be inclined to accept the tube, but again as the damage isn't from a manufacturing deviation, I want to get your approval.

-Chris

